HSPE Item Specifications

"Enduring and Important Knowledge" identified in previous grade-levels may be included within the context of some problems.

Prioritized Standards		Knowledge/Skills Assessed	Item Specifications
1.12.6 Determine an approximate value of radical and exponential expressions using a variety of methods. (P) **1.12.7** Solve mathematical problems involving exponents and roots. (P) Perform addition, subtraction, and scalar multiplication on matrices. (P) **1.12.8** Identify and apply real number properties to solve problems. (C)	**Concepts**	**1.12.8** Identify real number properties.	**1.12.8** Variables may be used.
	Procedures	**1.12.6** Determine an approximate value of radical and exponential expressions using a variety of methods. **1.12.7** Solve mathematical problems involving exponents and roots. Perform addition, subtraction, and scalar multiplication on matrices.	**1.12.6** Items may use square roots of numbers up to 225, 400, 625 and 900 and cube roots of whole numbers up to 125 and 1,000. Items may use positive integer exponents only. Answers choices may be ranges of numbers or a single number. The law of exponents will not be assessed. **1.12.7** Items should focus on computation with numbers. Working with algebraic expressions is assessed in 2.12.6. Items may include square numbers up to 225, 400, 625 and 900 or cubic numbers to 125 and 1,000. Items may include positive integer exponents only. Matrices may be up to 3 x 3.
	Problem		

HSPE Item Specifications

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Prioritized Standards		Knowledge/Skills Assessed	Item Specifications
2.12.1 Use algebraic expressions to identify and describe the n^{th} term of a sequence. (PS) **2.12.2** Isolate any variable in given equations, inequalities, proportions, and formulas to use in mathematical and practical situations. (P) **2.12.3** Add, subtract, multiply, and factor 1^{st} and 2^{nd} degree polynomials connecting the arithmetic and algebraic processes. (P) Simplify algebraic expressions, including exponents and radicals. (P) **2.12.4** Determine the domain and range of functions, including linear, quadratic, and absolute value, algebraically and graphically. (P) Solve absolute value equations and inequalities both algebraically and graphically. (P) **2.12.5** Solve systems of two linear equations algebraically and graphically and verify solutions (with and without technology). (P) **2.12.6** Solve mathematical and practical problems involving linear and quadratic equations with a variety of methods, including discrete methods (with and without technology). (P, PS)	**Concepts**		
	Procedures	**2.12.2** Isolate any variable in given equations, inequalities, proportions, and formulas to use in mathematical situations. **2.12.3** Add, subtract, multiply, and factor 1^{st} and 2^{nd} degree polynomials connecting the arithmetic and algebraic processes. Simplify algebraic expressions, including exponents and radicals. **2.12.4** Determine the domain and range of functions, including linear, quadratic, and absolute value, algebraically and graphically. Solve absolute value equations and inequalities both algebraically and graphically. **2.12.5** Solve systems of two linear equations algebraically and verify solutions. **2.12.6** Solve mathematical problems involving linear and quadratic equations with a variety of methods, including discrete methods.	**2.12.2** Items should ask students to solve multi-variable equations, inequalities, proportions, and formulas for a specified variable. Equations and formulas should not be widely recognized. Do not use geometric formulas that may be used in 3.12.5. **2.12.3** For factoring polynomials, rational roots may be used. Coefficient of x^2 not greater than 3. Expressions may include algebraic fractions. Positive exponents only. **2.12.4** Function notation may be used. Absolute value equations and inequalities should only have variables on one side. Absolute value inequalities must have only a variable inside the absolute value symbol. **2.1.2.5** Items may have rational solutions. Items should focus on algebraic methods, graphical solutions are assessed in 4.12.5. **2.12.6** Answers may be given in radical form. Limited to two unknowns.

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	Problem Solving	**2.12.1** Use algebraic expressions to identify and describe the n^{th} term of a sequence. **2.12.6** Solve practical problems involving linear and quadratic equations with a variety of methods, including discrete methods.	**2.12.1** Items may ask students to write the rule to find the n^{th} term in the pattern, find the n^{th} term in the pattern, and identify the pattern given the rule. Expressions used to describe the n^{th} term may be one or two terms. **2.12.6** Answers may be given in radical form. Limited to two unknowns.

HSPE Item Specifications

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Prioritized Standards		Knowledge/Skills Assessed	Item Specifications
3.12.2 Justify, communicate, and differentiate between precision, error, and tolerance in practical problems. (C, PS) **3.12.3** Select and use appropriate measurement tools, techniques, and formulas to solve problems in mathematical and practical situations. (P, PS) **3.12.4** Interpret and apply consumer data presented in charts, tables, and graphs to make informed financial decisions related to practical applications. (C, PS) **3.12.5** Determine the measure of unknown dimensions, angles, areas, and volumes using relationships and formulas to solve problems. (P, PS)	**Concepts**	**3.12.2** Justify, communicate, and differentiate between precision, error, and tolerance. **3.12.4** Interpret consumer data presented in charts, tables, and graphs to make informed financial decisions.	**3.12.2** Items may ask students which measurement is most precise. Items may ask students about error / tolerance when error / tolerance is given in stem.. **3.12.4** The following financial terms are considered common knowledge: Interest, principal, rate, profit, loss, debt, income, net income, gross income, tax, and tip.
	Procedures	**3.12.3** Select and use appropriate measurement tools, techniques, and formulas to solve problems in mathematical situations. **3.12.5** Determine the measure of unknown dimensions, angles, areas, and volumes using relationships and formulas.	**3.12.3** Items might ask students to use techniques and formulas to calculate and compare rates, distances ($d = rt$), and temperatures. Temperature items should require students to convert between Celsius and Fahrenheit. Context is ok but not necessary. **3.12.5** Items will not require the use of trigonometric ratios.
	Problem Solving	**3.12.2** Justify, communicate, and differentiate between precision, error, and tolerance in practical problems. **3.12.3** Select and use appropriate measurement tools, techniques, and formulas to solve problems in practical situations. **3.12.4** Interpret and apply consumer data presented in charts, tables, and graphs to make informed financial decisions related to practical applications. **3.12.5** Determine the measure of unknown dimensions, angles, areas, and volumes using relationships and formulas to solve problems.	**3.12.2** Items should ask students to solve problems involving error and tolerance. Tolerance problems may use the ± symbol. Students should be asked to determine error / tolerance. **3.12.3** Items might ask students to select and use techniques and formulas to calculate and compare rates, distances ($d = rt$), and interest. Items can ask to solve for any of the variables within the formula. **3.12.4** Data may be presented in a list **3.12.5** Items will not require the use of trigonometric ratios. Items may ask students to work backwards through a formula.

HSPE Item Specifications

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Prioritized Standards		Knowledge/Skills Assessed	Item Specifications
4.12.1 Identify and use the parts of a circle to solve mathematical and practical problems. (C, P, PS) Identify and apply properties of interior and exterior angles of polygons to solve mathematical and practical problems. (C, P, PS) **4.12.2** Apply properties of similarity through right triangle trigonometry to find missing angles and sides. (P) **4.12.5** Determine the slope of lines using coordinate geometry and algebraic techniques. (C, P) Identify parallel, perpendicular, and intersecting lines by slope. (C) Graph linear equations and find possible solutions to those equations using coordinate geometry. (P) Find possible solution sets of systems of equations whose slopes indicate parallel, perpendicular, or intersecting lines. (PS)	**Concepts**	**4.12.1** Identify the parts of a circle. Identify properties of interior and exterior angles of polygons. **4.12.5** Determine the slopes of lines using coordinate geometry. Identify parallel, perpendicular, and intersecting lines by slope.	**4.12.1** Parts of a circle include: central angles, inscribed angles, arcs, chords, secants, and tangents. Identify and describe angle relationships. Identify the sum of the measures of the exterior angles on a regular convex polygon. *Match sums to grade 7 or 8 or do not do.* **4.12.5** Determine the slope of a line graphed on a coordinate plane or from the equation in slope-intercept form. Items may ask students to identify parallel, perpendicular, or intersecting lines, given two equations (in slope-intercept form) that represent lines. Items may ask students to identify the equation or graph of a line that is parallel or perpendicular to a given line.

	Procedures	**4.12.1** Use the parts of a circle to solve mathematical problems. Apply properties of interior and exterior angles of polygons to solve problems. **4.12.2** Apply properties of right triangle trigonometry to find missing angles and sides. Apply properties of similarity to find missing side. **4.12.5** Determine the slopes of lines using algebraic techniques. Graph linear equations and find possible solutions of those equations using coordinate geometry.	**4.12.1** Items may ask students to determine the missing measure of a part of a circle. Calculate the measures of 1 exterior angle of a regular polygon. Calculate the missing measure of an angle in a polygon. Calculate the measure of 1 interior angle of a regular polygon. **4.12.2** Determine the missing length of a side of a triangle, given a similar triangle. Use right triangle trigonometry (sine, cosine, and tangent) to determine the missing length or angle measure in a right triangle. Limit right triangles to 45-45-90 and 30-60-90. **4.12.5** Determine the slope of a line given an equation in non-slope intercept form or given the locations of two points on a line or line segment. Select the correct graph of a given equation. Find solutions of an equation graphed on a coordinate plane.
	Problem Solving	**4.12.1** Use the parts of a circle to solve problems. Apply properties of interior and exterior angles of polygons to solve practical problems**.** **4.12.5** Find possible solution sets of systems of equations whose slopes indicate parallel, perpendicular, or intersecting lines	**4.12.1** Items may ask students to determine the missing measure of a part of a circle. **4.12.5** Items may use no more than two sets of equations. Items should focus on geometry skills more than algebra.

HSPE Item Specifications

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Prioritized Standards		Knowledge/Skills Assessed	Item Specifications
4.12.6 Solve problems using complementary and supplementary angles, congruent angles, vertical angles, angles formed when parallel lines are cut by a transversal and angles in polygons. (P, PS) **4.12.7** Apply the Pythagorean Theorem and its converse in mathematical and practical situations. (P, PS) **4.12.9** Formulate, evaluate, and justify arguments using inductive and deductive reasoning in mathematical and practical situations. (PS)	**Concepts**		
	Procedures	**4.12.6** Solve problems using complementary and supplementary angles, congruent angles, vertical angles, angles formed when parallel lines are cut by a transversal and angles in polygons. **4.12.7** Apply the Pythagorean Theorem and its converse in mathematical situations.	**4.12.6** Items may ask students to calculate angle measures. **4.12.7** Items may ask students to determine the missing measure of a leg or hypotenuse of a right triangle. Items may use radical form.
	Problem Solving	**4.12.6** Solve problems using complementary and supplementary angles, congruent angles, vertical angles, angles formed when parallel lines are cut by a transversal and angles in polygons. **4.12.7** Apply the Pythagorean Theorem and its converse in practical situations. **4.12.9** Formulate, evaluate, and justify arguments using inductive and deductive reasoning in mathematical and practical situations.	**4.12.6** Items must involve multi-step or practical situations. **4.12.9** Items may include Venn diagrams, counterexamples, and conditional statements.

HSPE Item Specifications

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Prioritized Standards		Knowledge/Skills Assessed	Item Specifications
5.12.1 Organize statistical data through the use of tables, graphs, and matrices (with and without technology). (P) **5.12.2** Select and apply appropriate statistical measures in mathematical and practical situations. (C, P, PS) **5.12.3** Distinguish between a sample and a census. (C) Identify sources of bias and their effect on data representations and statistical conclusions. (C, PS) Use the shape of a normal distribution to compare and analyze data from a sample. (PS) **5.12.4** Apply permutations and combinations to mathematical and practical situations, including the Fundamental Counting Principle. (P, PS) **5.12.5** Determine the probability of an event with and without replacement using sample spaces. (C, P, PS) Design, conduct, analyze, and effectively communicate the results of multi-stage probability experiments. (PS)	**Concepts**	**5.12.2** Select appropriate statistical measures in mathematical and practical situations. **5.12.3** Distinguish between a sample and a census. Identify sources of bias and their effect on data representations and statistical conclusions. **5.12.5** Determine the probability of a simple event.	**5.12.2** Identify measures of central tendency (median, mode) and variability (range, inter-quartile range) given a set of data. Measures of central tendency or variation must be identifiable visually, without calculation. **5.12.3** Identify a data collection strategy that would result in a biased sample.
	Procedures	**5.12.1** Organize statistical data through the use of tables, graphs, and matrices. **5.12.2** Apply appropriate statistical measures in mathematical situations. **5.12.4** Apply permutations and combinations to mathematical situations, including the Fundamental Counting Principle. **5.12.5** Determine the probability of an event with and without replacement using sample spaces.	**5.12.1** Lower grade –level displays may be used. Items may ask students to select the correct data display given a set of data. **5.12.2** Calculate and apply measures of central tendency (mean, median, mode) and variability (range, inter-quartile range) to solve mathematical problems. **5.12.5** Items may use up to 2 events.

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	Problem Solving	**5.12.2** Apply appropriate statistical measures in practical situations.	**5.12.2** Calculate and apply measures of central tendency (mean, median, mode) and variability (range, inter-quartile range) to solve practical problems.
		5.12.3 Identify sources of bias and their effect on data representations and statistical conclusions. Use the shape of a normal distribution to compare and analyze data from a sample.	**5.12.3** Determine the appropriateness of a data display.
		5.12.4 Apply permutations and combinations to mathematical and practical situations, including the Fundamental Counting Principle.	
		5.12.5 Determine the probability of an event with and without replacement using sample spaces. Design, analyze, and effectively communicate the results of multi-stage probability experiments.	**5.12.5** Items may ask students to determine the probability of an activity with up to 3 events.